



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/026,278	12/18/2001	Eko N. Onggosanusi	TI-32854	8075
23494	7590	07/23/2009	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED			WONG, LINDA	
P O BOX 655474, M/S 3999				
DALLAS, TX 75265			ART UNIT	PAPER NUMBER
			2611	
			NOTIFICATION DATE	DELIVERY MODE
			07/23/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com

Office Action Summary	Application No.	Applicant(s)	
	10/026,278	ONGGOSANUSI ET AL.	
	Examiner	Art Unit	
	LINDA WONG	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 28 March 2007.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-69 and 71-74 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) 50-52 is/are allowed.
- 6) Claim(s) 1,2,10,13,14,19,21-32,39,40,42-44,47-49,53-69 and 71-74 is/are rejected.
- 7) Claim(s) 3-9,11,12,15-18,20,33-38,41,45 and 46 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ . | 6) <input type="checkbox"/> Other: _____ . |

Response to Arguments

1. Applicant's arguments with respect to claims 1-74 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. **Claim 31** is objected to because of the following informalities: Claim 31 recites the limitation "a transmitter comprising" on line 2 as well as on line 5. The two transmitters contain the same limitations and are considered duplicate limitations. Appropriate correction is required.
3. **Claim 61** recites the limitation "the step of despreading" in claim 60. There is insufficient antecedent basis for this limitation in the claim.
4. **Claim 69** recites the limitation "the step of spreading" in claim 68. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 31-38** are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: between the transmitter recited on line 2 and receiver recited on line 5. (claim 31)

Note: For the purpose of the prior art rejection, the limitation "a receiver" will be read as "a receiver for receiving signals from the transmitter".

6. Claims 32-38 are rejected based on the independent claim.
7. **Claim 64** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
 - a. **Claim 64** recites the limitation "converting a group of plurality signals to serial signals". When plurality of signals are converted, one serial signal is produced.
How can one have "serial signals"?

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. **Claims 1,2,10,13-14,27-28,31,32,39,40** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Alexander, Jr. et al (US Patent No.: 6259924).

- a. **Claim 1,**
 - i. Lin et al discloses
 - "a plurality of receive antennas for receiving the signals as influenced by a channel effect between the receiver and transmitter" (Fig. 3, label

61, wherein condition of the channel would affect the quality of the signal.)

- "circuitry for multiplying the signals with a conjugate transpose of" a power estimate "with a conjugate transpose of a linear basis transformation matrix" (Col. 7, equation 6 determines the conjugate transpose of the power estimates, c, and basis vectors, e, wherein the distribution law of conjugate transpose would indicate the conjugate transpose would be performed on both the power estimates and basis vectors.)
- "circuitry for selecting the linear basis transformation matrix from a finite set of linear basis transformation matrices" (Col. 8, lines 56-62 discloses selecting the orthonormal basis.)
- "circuitry for removing the interference between the respective streams" (Col. 1, lines 41-52 discloses interference sources cause the receiver to be unreliable. Synchronization of phase (change all phases) is needed to remove the misalignment or interference caused by these sources. (Col. 3, lines 6-14))
 - ii. Lin et al fails to disclose "channel estimation". Alexander, Jr. et al disclose power monitoring can be performed using channel impulse responses or effect of the channel. (Col. 8, lines 26-42) It would have been obvious to one skilled in the art at the time of the invention to power monitor based on the channel estimation as disclosed by Alexander, Jr. et al into Lin et al's

conjugate transpose calculation so to provide an accurate determination of adjustment of power, thus cost effectively allocating power.

- b. **Claims 2,32,40,**
 - i. Alexander, Jr. et al discloses "circuitry for determining the estimate of the channel effect" (Fig. 6, label 612).
 - ii. Lin et al discloses "circuitry for selecting selects the linear basis transformation matrix in response to the estimate of the" power. (Col. 7, lines 45-50 discloses the optimal weight corresponds to the weight vector is selected based on the power.)
 - iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced by channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.
- c. **Claim 10,** Lin et al discloses "circuitry for communicating an identification of the linear basis -transformation matrix to the transmitter via a feedback channel." (Col. 5, lines 15-20 discloses the DSP feedback the phase-shifter adjustment signals to the transmitter and receiver as shown in fig. 4.)
- d. **Claims 13 and 14,** Lin et al discloses "the linear basis transformation matrix is operable for performing a rotation and phase change of the symbols" (Col. 9, e)

shows the weights are phase shifted, wherein phase shifting will also perform rotation.)

- e. **Claim 27** Lin et al discloses the plurality of transmit antennas and the plurality of receive antennas are a same number of antennas. (Fig. 4, label 130 shows the antennas used for both transmission and reception, wherein the number would be the same.)
- f. **Claim 28**, Lin et al discloses the same number equals two. (Fig. 4, label 130 shows the antennas used for both transmission and reception, wherein the number can be 2.)
- g. **Claim 31** recites all the limitations of claim 1, but claim 1 does not recite the following limitations:
 - i. Lin et al discloses
 - “a transmitter” (Fig. 3, label 70) and
 - “wherein interference occurs between the respective streams” (Fig. 3, labels 70, 68 show transmitters sending information to the receiver, label 61.) Although Lin et al does not disclose co-channel interference, such an interference would occur amongst signals traveling to the same receiver, thus it would have been obvious to one skilled in the art to consider co-channel interference found in the received signals so to eliminate interference thus allowing for proper decoding of the signal.
 - “a receiver for receiving signals from the transmitter” (Fig. 3, label 61.) Although Lin et al does not disclose “the transmitter comprising a

plurality of transmit antennas for transmitting the signals which comprise respective streams of independent symbols”, the transmitter can be composed for multiple or one antenna used for transmission. It would have been obvious to one skilled in the art the time of the invention to have one or more antennas of the transmitter based on inventor's choice. The examiner takes official notice.

h. **Claim 39** recites all the limitations of claim 1, but claim 1 does not recite the following limitations:

i. Lin et al discloses

- “receiving signals a plurality of receive antennas and transmitted from a transmitter” (Fig. 3, label 61. Fig. 3, labels 70, 68 show transmitters sending information to the receiver, label 61.)
- Although Lin et al does not disclose “the transmitter comprising a plurality of transmit antennas for transmitting the signals which comprise respective streams of independent symbols”, the transmitter can be composed for multiple or one antenna used for transmission. It would have been obvious to one skilled in the art the time of the invention to have one or more antennas of the transmitter based on inventor's choice. The examiner takes official notice.
- “wherein interference occurs between the respective streams and wherein the received signals are influenced by a channel effect between the receiver and transmitter” (Fig. 3, labels 70, 68 show

transmitters sending information to the receiver, label 61, wherein the channel would cause interference in the channel.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. **Claims 21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al, further in view of Hafeez et al (US Patent No.: 6920191).
 - a. **Claim 21,**
 - i. Lin et al in view of Alexander, Jr. et al fails to disclose “circuitry for determining the estimate of the channel effect in response to pilot symbols received from the transmitter”.
 - ii. Hafeez et al discloses such a limitation. (Fig. 2, label 213 training symbols and label 218 channel estimator) It would have been obvious to one skilled in the art at the time of the invention to incorporate calculating channel estimation with known training symbols so to accurately determine channel estimation.

10. **Claims 19,22-26,30,53** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al, further in view of Heath, Jr. et al (US Patent No.: 6298092).

- a. **Claims 19,26,53**, Lin et al and Alexander, Jr. et al fail to disclose "the circuitry for multiplying comprises space time block coded decoding circuitry".
- b. Heath, Jr. et al discloses such a limitation. (Col. 3, lines 60-65 discloses space time block code, wherein a receiver will have the same decoder in order to decipher the message sent.) It would have been obvious to one skilled in the art at the time of the invention to incorporate space time block decoding as disclosed by Heath, Jr. et al into Lin et al in view of Alexander, Jr. et al so to efficiently decipher information transmitted and provide robustness to Lin et al's invention.
- c. **Claim 22,**
 - i. Lin et al in view of Alexander, Jr. et al fails to disclose "the circuitry for removing the interference between the respective streams is selected from a group consisting of circuitry for zero forcing, circuitry for determining a minimum mean square error, and circuitry for determining a maximum likelihood."
 - ii. Heath, Jr. et al discloses such a limitation .(Claim 14) It would have been obvious to one skilled in the art to select from such a group for interference elimination as disclosed by Heath, Jr. et al in to Lin et al in view of Alexander, Jr. et al so to effectively and robustly eliminate interference.

- d. **Claim 23**, Heath, Jr et al discloses "the signals comprise CDMA signals and further comprising circuitry for despreading the CDMA signals." (Fig. 4, label decoder, wherein a decoder can perform despreading. Col. 4, lines 30-35 discloses CDMA signals.)
- e. **Claim 24**, Heath, Jr. et al discloses TDMA signals. (Col. 4, lines 30-35 discloses TDMA signals.)
- f. **Claim 25**, Heath, Jr. et al discloses "the symbols are selected from a group consisting of quadrature phase shift keying symbols, binary phase shift keying symbols and quadrature amplitude modulation symbols." (Col. 3, lines 49-51 discloses selecting among such modulations.)
- g. **Claim 30**,
 - i. Heath, Jr. et al discloses
 - "a deinterleaver coupled to receive an output" (Fig. 4, label 102)
 - "a decoder coupled to receive an output of the deinterleaver" (Fig. 4, label 102 acts as deinterleaver and decoder.)
 - ii. Heath, Jr. et al fails to disclose "a demodulator coupled to the receive signals", but Heath, Jr et al discloses a receive processing unit and a modulator (Fig. 4, label 87 shows a receiving processing unit. Fig. 3, label modulation), wherein given a modulator, the receiving unit will have an equal and comparable demodulator. Thus, it would have been obvious to one skilled in the art at the time of the invention to incorporate demodulator

in the receiving processing unit as disclosed by Heath, Jr. et al so to effectively decode the information transmitted.

- iii. Heath, Jr. et al fails to disclose a multiplying circuitry. Lin et al discloses such a limitation (Fig. 3, label 62) and a user interface, where decoding of information from the received signal would be performed.

11. **Claim 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al (US Patent No.: 6259924).

- a. **Claim 29**, Lin et al in view of Alexander, Jr. et al fails to disclose "the plurality of transmit antennas are less in number than the plurality of receive antennas." Although Lin et al and Alexander, Jr. et al fails to disclose the number of transmit antennas are less, it would have been obvious to one skilled in the art to have less number of transmit antennas depending on the inventor's choice and to reduce cost.

12. **Claims 42-44,47-48,57-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596).

- a. **Claim 42,**
- i. Lin et al discloses
- "a transmitter for transmitting the signals, the signals comprising a plurality of independent streams of data symbols" (Fig. 3, label 70

shows the transmitters, wherein the transmit signal would have data symbols.)

- “circuitry for selecting a linear basis transformation matrix from one of at least two matrices in response to a communication received by the transmitter from the receiver via a feedback channel” (Col. 8, equation 9 shows the linear basis transformation matrix, Fig. 4, label dsp and 124 and 125 show the feedback, Col. 5, lines 9-11 discloses the optimal weight is determined based on power monitoring, which is determined based on the communication between the transmitter and receiver.)
- “circuitry for multiplying the data symbols with the linear basis transformation matrix, wherein the signals are responsive to the multiplication with the linear basis transformation matrix” (Fig. 3, label 62 for multiplying the weights with the received data.)

ii. Lin et al fails to disclose “a plurality of transmit antennas”. the transmitter can be composed for multiple or one antenna used for transmission. It would have been obvious to one skilled in the art the time of the invention to have one or more antennas of the transmitter based on inventor's choice. The examiner takes official notice.

b. **Claim 43,**

i. Lin et al discloses

- “circuitry for selecting the linear basis transformation matrix” (Col. 7, equation 5, Col. 8, equation 9, lines 55-62 and Col. 9, b) discloses selecting the linear basis transformation matrix.)
 - “circuitry for providing the communication to the transmitter via the feedback channel” (Col. 5, lines 15-20 discloses the DSP feedback the phase-shifter adjustment signals to the transmitter and receiver as shown in fig. 4.)
- c. **Claim 44**, Lin et al discloses “circuitry for selecting the linear basis transformation matrix selects from a finite set of linear basis transformation matrices” (Col. 8, equation 9, Col. 9, lines 1-10 and b.).
- d. **Claims 47,48**, Lin et al discloses "the linear basis transformation matrix is operable for performing a rotation and phase change of the symbols" (Col. 9, e) shows the weights are phase shifted, wherein phase shifting will also perform rotation.)
- e. **Claims 57,58**, Lin et al discloses the plurality of transmit antennas and the plurality of receive antennas are a same number of antennas. (Fig. 4, label 130 shows the antennas used for both transmission and reception, wherein the number would be the same.)
13. **Claims 54-56** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Heath, Jr. et al (US Patent No.: 6298092)/

- a. **Claim 54**, Heath, Jr et al discloses "the signals comprise CDMA signals and further comprising circuitry for despreading the CDMA signals." (Fig. 4, label decoder, wherein a decoder can perform despreading. Col. 4, lines 30-35 discloses CDMA signals.)
- b. **Claim 55**, Heath, Jr. et al discloses TDMA signals. (Col. 4, lines 30-35 discloses TDMA signals.)
- c. **Claim 56**, Heath, Jr. et al discloses "the symbols are selected from a group consisting of quadrature phase shift keying symbols, binary phase shift keying symbols and quadrature amplitude modulation symbols." (Col. 3, lines 49-51 discloses selecting among such modulations.)

14. **Claim 59** is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al in view of Alexander, Jr. et al (US Patent No.: 6259924).

- a. **Claim 59**, Lin et al in view of Alexander, Jr. et al fails to disclose "the plurality of transmit antennas are less in number than the plurality of receive antennas." Although Lin et al and Alexander, Jr. et al fails to disclose the number of transmit antennas are less, it would have been obvious to one skilled in the art to have less number of transmit antennas depending on the inventor's choice and to reduce cost.

15. **Claims 60-67** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Alexander, Jr. et al (US Patent No.: 6259924), further in view of Hafeez et al (US Patent No.: 6920191).

a. **Claim 60,**

- i. Lin et al discloses
 - "receiving a plurality of signals" (Fig. 3, label 61)
 - "selecting a matrix from a finite set of matrices in response to one of the" power "and an interference cancellation technique" (Col. 7, lines 45-50 discloses the optimal weight corresponds to the weight vector is selected based on the power.)
 - "multiplying the plurality of signals by the" power "and the matrix" (Fig. 3, label 62 for multiplying the signals with the output from the weight generator, label 66. Col. 7, equation 6 shows the signals are multiplied by the weight matrices.)
- ii. Lin et al fails to disclose "channel estimate" is used for selection and multiplication.
- iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced by channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.

- iv. Lin et al fails to disclose “producing a channel estimate in response to a predetermined signal of the plurality of signals”.
 - v. Hafeez et al discloses such a limitation. (Fig. 2, label 213 training symbols and label 218 channel estimator) It would have been obvious to one skilled in the art at the time of the invention to incorporate calculating channel estimation with known training symbols so to accurately determine channel estimation.
- b. **Claim 61**, Heath, Jr et al discloses despreading the plurality of signals in response to a code.” (Fig. 4, label decoder, wherein a decoder can perform despreading, wherein despreading would be performed with a code.)
- c. **Claim 62**, Lin et al discloses “removing interference from the plurality of signals.” (Col. 1, lines 41-52 discloses interference sources cause the receiver to be unreliable. Synchronization of phase (change all phases) is needed to remove the misalignment or interference caused by these sources. (Col. 3, lines 6-14))
- d. **Claim 63**,
- i. Lin et al discloses
 - “identifying the selected matrix to a remote receiver” (Col. 9, b),c),d),e))
 - “calculating a product of the” power “and the selected matrix prior to step of multiplying” (equation 6 shows the multiplication of the basis matrix with the power matrix. Based on the distribution law of multiplication, the product of the power and basis matrix can be

calculated prior to multiplication with X or the received signal as shown in equation 6.)

- ii. Lin et al fails to disclose “channel estimate”.
- iii. Alexander, Jr. et al discloses power can be determine based on the channel estimate (Col. 8, lines 26-42), thus it would have been obvious to one skilled in the art at the time of the invention to incorporate selecting the basis matrix as disclosed by Lin et al based on the power produced by channel estimation as disclosed by Alexander, Jr. et al so to provide accurate adjustment of the signals so to eliminate interference effectively.

e. **Claim 64,**

- i. Heath, Jr. et al disclose
 - “converting a group of the plurality of signals to serial signals” (Fig. 4, label 98 converts the plurality of signals to a serial signal.)
 - “demodulating the serial signals” (Fig. 4, label decoding, wherein decoding can also perform the functionalities of demodulation.)
 - “deinterleaving the serial signals” (Fig. 4, label 102)
 - “decoding the serial signals” (Fig. 4, label 102)
 - ii. it would have been obvious to one skilled in the art at the time of the invention
- f. **Claim 65,** Hafeez et al discloses “the predetermined signal comprises at least one pilot symbol”. (Fig. 2, label 213 training symbols and label 218 channel estimator)

- g. **Claim 66**, Lin et al discloses "the matrix is a linear basis transformation matrix." (Col. 9, lines 1-14 shows examples of the basis matrix.)
- h. **Claim 67**, Lin et al discloses "the step of receiving the plurality of signals from a plurality of remote transmit antennas, wherein the plurality of signals are encoded differently for each respective antenna of the plurality of transmit antennas." (Fig. 3, labels 70,68,72 shows the plurality of signals, wherein each mobile station transmits different signals and each one would be encoded differently.)

16. **Claims 68-69,71-74** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent No.: 6392596) in view of Heath, Jr. et al (US Patent No.: 6298092).

- a. **Claim 68**,
 - i. Lin et al discloses
 - "receiving a plurality of signals" (Fig. 3, label 61)
 - "selecting a matrix from one of at least 2 matrices in response to a signal from a remote transmitter" (Col. 8, lines 56-62 discloses selecting the orthonormal basis.)
 - "multiplying the signals by the matrix" (Col. 7, equation 6 multiplies the received signals with the matrix.)
 - "transmitting the multiplied signals from a plurality of transmit antennas" (Fig. 4, label 134)

Art Unit: 2611

- ii. Lin et al fails to disclose “modulating the plurality of signals”.
 - iii. Lin et al shows a transceiver (Fig. 4) but fails to disclose a modulator. Heath, Jr. et al discloses such a limitation. (Fig. 3, label modulation.) It would have been obvious to one skilled in the art at the time of the invention to incorporate modulation as disclosed by Heath, Jr. et al in to Lin et al's invention so to prepare the signal for transmission.
- b. **Claim 69**, Heath, Jr. et al discloses “the step of spreading the plurality of signals in response to a code.” (Fig. 3, label modulation, wherein spreading is a type of modulation performed with a code and can be performed in the disclosed modulator depending on the choice of the inventor.)
- c. **Claim 71**,
- i. Heath, Jr. et al discloses
 - “encoding the plurality of signals” (Fig. 3, label pre-coder)
 - “interleaving the plurality of signals” (Fig. 3, label interleaver)
 - “converting the plurality of signals to serial signals” (Fig. 4, label 98 combines the plurality of signals to produce one serial signal.)
- d. **Claim 72**,
- i. Lin et al discloses
 - “receiving a plurality of signals” (Fig. 3, label 61)
 - “selecting a matrix from one of at least 2 matrices in response to a signal from a remote transmitter” (Col. 8, lines 56-62 discloses selecting the orthonormal basis.)

- “multiplying the signals by the matrix” (Col. 7, equation 6 multiplies the received signals with the matrix.)
 - “transmitting the multiplied signals from a plurality of transmit antennas” (Fig. 4, label 134)
- ii. Lin et al fails to disclose “modulating the plurality of signals”.
- iii. Lin et al shows a transceiver (Fig. 4) but fails to disclose a modulator. Heath, Jr. et al discloses such a limitation. (Fig. 3, label modulation.) It would have been obvious to one skilled in the art at the time of the invention to incorporate modulation as disclosed by Heath, Jr. et al into Lin et al's invention so to prepare the signal for transmission.
- iv. Lin et al fails to disclose “transmitting a predetermined signal to a remote receive on a channel different from a channel of the plurality of signals”.
- v. Such a transmission can be performed in any transmitter as shown in Fig. 3. It would have been obvious to one skilled in the art at the time of the invention to transmit predetermined signals so to provide information for easy decoding of the data signals.
- e. **Claim 73**, Lin et al discloses “the matrix is a linear basis transformation matrix.” (Col. 9, lines 1-14 shows examples of the basis matrix.)
- f. **Claim 74**, Lin et al discloses “the step of receiving the plurality of signals from a plurality of remote transmit antennas, wherein the plurality of signals are encoded differently for each respective antenna of the plurality of transmit antennas.” (Fig. 3, labels 70,68,72 shows the plurality of signals, wherein each

mobile station transmits different signals and each one would be encoded differently.)

Allowable Subject Matter

17. **Claims 50,51-52** are allowed over prior art.
18. **Claims 3-9,11-12,15-18,20,33-38,41,45-46** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LINDA WONG whose telephone number is (571)272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Linda Wong
7/19/2009
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611